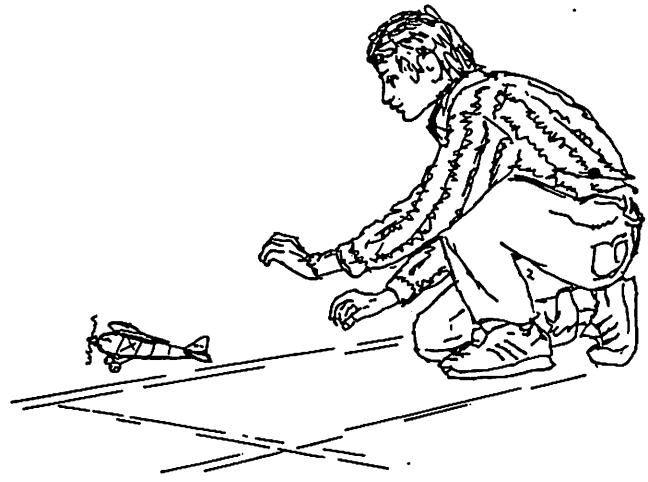
Indoor News



Issue 32 May 1995

DIARY

17-18 June Cholet France	**Criterium Int. Sèvres & Maine,** F1D, F1D-Beg, EZB, Micro 35, Sainte Formule, C. Bodin, 2 Rue Du Moulin Du Pain, 49130 Ste Gemmes Sur Loire, France, Tel. +41471697. See details in this issue.
24-25 June Orleans France	**International Competition Orleans,** F1D, F1D-B, F1L (EZB), J. Delcroix, 7 rue de Foncemagne, 45000 Orleans, France, Tel. +33 3863 4957.
1-2 July Stuttgart Germany	**Stuttgarter INDOOR-CUP,** F1D-Invitational - participating teams from Switzerland, Hungary, Germany. T. Merkt, Kuckucksruf 6, 70569 Stuttgart, Germany, Tel. +(0)711 6874171.
13-14 Aug Nagoya Japan	**Nagoya Nuts '95,** Peanut (Modern, WW1/2, Pioneer, Golden Age, one design Volksplane), Pistachio. Proxy entries are welcome. Kazuhiro Suzuki, 4-94 Kashihara-Cho, Kasugai Aichi 486, Japan.
18-20 Aug Maastricht Netherlands	**Interscale '95,** F4D, F4E, F4F and Pistachio, T. Schippers, P.O.Box 2060, 6201CD Maastricht, Netherlands, Tel. +31.(0)79.212195.
27-28 Aug Cardington England	**British Indoor Nationals,** Index over 2 days, 27th: F1L EZB, LPP, 28th: F1D incl. Team Trials, LRS. **Before** travelling to Cardington contact Laurie Barr, Herries Cottage, Winter Hill Road, Pinkneys Green, Berks. SL6 6PJ, England, Tel. +(0)1628 487544.
26Sep/1 Oct Slanic Romania	**European Championships F1D,** Federatia Romana de Modelism, M. Zanciu, V. Conta 16, Sec 2, Bucarest 70139, Romania, Tel. +40 1 2100161, fax +40 1 2110160
2/3 Oct Slanic Romania	**Euroindoor F1D Open International,** Federatia Romana de Modelism, see above.

1996 Indoor World Championships

The 1996 F1D World Championships will be held in the Czech Republic. Romania has offered to host the 1997 European Championships and the 1998 World Championships.

Shoichi Uchida deceased

by Jiro Sugimoto (JAP)

Sad news, I'm sorry to say. Shoichi Uchida (editor of the Japanese Peanut newsletter P-tech), age 62, passed away on January 28, of apoplexy (cerebral hemorrhage). I visited him in the hospital, but he was still unconscious. His death was a great shock to us, but he will be able to meet Walt Mooney and Bob Peck in heaven. I attended the funeral with our club members on January 29 at Ogaki. I put his remarkable Peanut models Mustang, BD-4, No-Cal Gee Bee an Pistachio Lacey M-10 on his coffin. They were cremated with him. He will be able to enjoy his models in heaven.

COLOPHON

Indoor News is published at least four times a year and covers all types of indoor models, from peanuts to microfilm. Texts can be sent in Dutch, English, German and French (I can read the latter two, but not write them). Please type your texts on 12,5 cm width. Texts can be sent on floppy disk (3½ or 5¼) in Wordperfect or ASCII format.

I can make the drawings, if you are no draftsman. I prefer payment of subscriptions per eight issues. When paying by Eurocheque, International Postal Money Order or with bank notes no additional bank fees are required. Please add NLG 6,50 for bank fees when paying by Eurogiro or NLG 20,00 with foreign checks. The Eurogiro account number is 4406860.

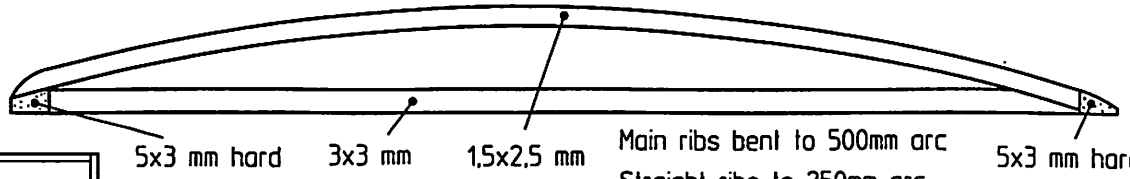
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The Netherlands

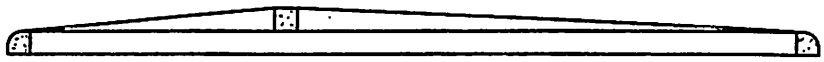
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Scale 1:1/1:5



Main ribs bent to 500mm arc
Straight ribs to 250mm arc
Ribs hot bent over metal sheet



All tailplane wood 3x3 mm

Wings covered with 100µm mylar		7.5 g
Tail covered with	2µm mylar	1.8 g
Body 2x50mA Kenway		33 g
Total		42.3 g

Fin off-set
for left turn

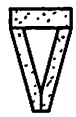
News Indoor

Electric Model

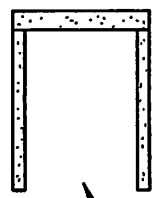
Heavy indoor or
E-30 fly-off model

Design: Paul Channon (GB)

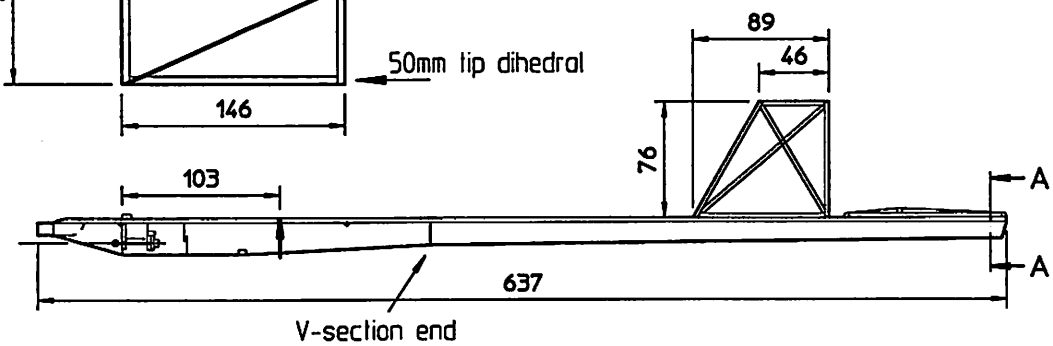
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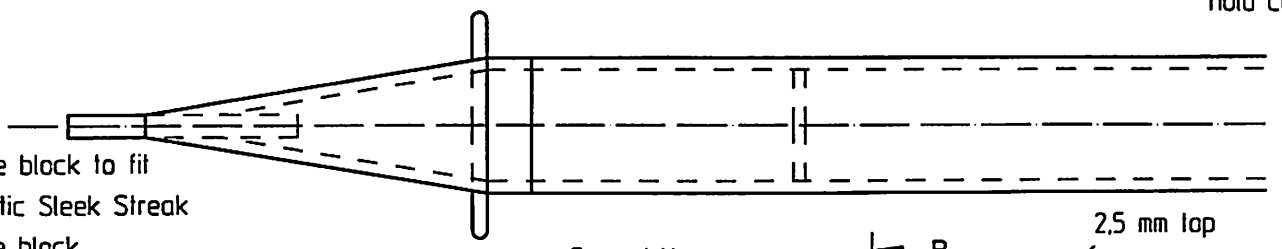


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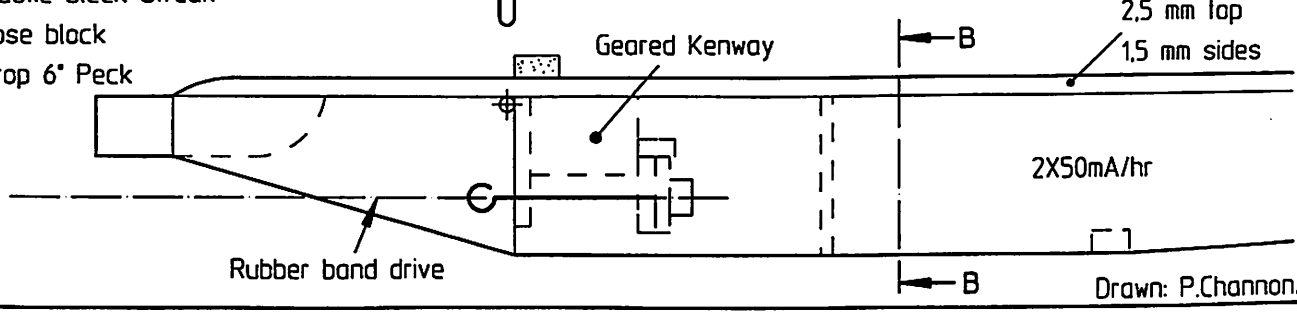


Open, cover with tape to hold cells





Nose block to fit
plastic Sleek Streak
nose block
Prop 6" Peck



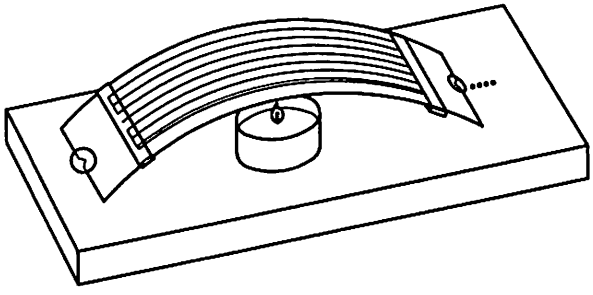
Drawn: P.Channon/T.André

ELECTRIC MODEL
by Paul Channon (GB)

This Electric Model can be flown indoors but it is also used as a fly-off model for the outdoor E-30 class. The model is powered by a geared Kenway motor on 2x50mA/hr cells. Duration is 1min 30 - 2 min under a 8 meter roof. This is on a low charge. 6 min motor run is possible with the 6" Peck prop used, but more height is needed, LOTS more height!

The wing ribs are hot bent over metal sheet. Strips are cut as for spars. Check strip by bending to find weak spots. Wet the wood, clip one end in place, bend over former and clip down the other side. I do all ribs together. Apply heat by "Night Light" small candle. In a couple of minutes you have a set of ribs.

The jig is made from a strip of alloy 1"x6". File a nick in the center of each end. Take a bit of ply or balsa 3"x9". Place a drawing pin to one side, place nick against pin and bend metal. Put another pin to hold the bend. Move the pins to increase or reduce the arc. The clips are made from thin alloy Litho plate.



PROPELLERS
The articles by Kai Halsas and Antti Jolma about can-formed propellers in recent issues of Indoor News led to some articles in the British "Norwind News" newsletter. Joe Maxwell presented a method to produce can-formed propellers without doing any calculations. Then John Barker managed to simplify this method even further. Both articles are reproduced in this issue. Still can-formed propellers deviate quite much from True Helical Pitch shaped propellers. Halsas and Jolma have now produced a method based on cone-shaped propellers which approaches the true helical pitch distribution very accurately, see elsewhere in this issue.

But to complicate things again: has a "true helical pitch" propeller the optimum pitch distribution to aim for? A helical pitch propeller has an angle of attack distribution along the blade which produces a certain amount of wash-out at the root and at the tip of the blade. Actually any propeller (helical, can-formed or produced by whatever method) is nothing more than a base helix (based on the forward and rotational speeds of the propeller) with a certain angle of attack added along the blade. John Barker points this out in a highly recommended article about propeller design methods in the recent 1994 Free Flight Forum Report.

1994 Free Flight Forum Report - available from Martin Dilly, 20 Links Road, West Wickham, Kent BR4 0QW, England. Price incl. postage £6.80 (UK), £7.25 (Europe), £8.50 (airmail elsewhere). Cheques should be payable to "BMFA FF Team Support Fund" and drawn on a bank with a branch in the UK.
Norwind News - newsletter of the British North West Indoor Association. Published about four times a year. For details contact Dave Yates, 24 Rivington Drive, Up Holland, WN8 0HB, England, Tel. +(0)695 623 437.

PROPS FROM CANS WITHOUT CALCS
by Joe Maxwell (GB)

Forming on a can, or other cylinder, is generally regarded as a simple, if somewhat inexact, method of producing the twist in blades of Indoor propellers. However, the geometry involved if one cares to delve into it, is by no means simple and, perhaps because of its complexity, has led to the publication of a number of erudite dissertations on the subject. The authors I have in mind are, in chronological order:

Max Chernoff	Model Aeronautics Yearbook 1964/65
Bob Meuser	NFFS Symposium Report 1973
Ron Williams	Building & Flying Indoor Model Airplanes 1981
Hermann Andresen	Phoenix MAC Newsletter, August 1986
Bud Tenny	Model Aviation, August and October 1988
Bill Hendersen	Model Aviation, Sept. and Dec. 1989
Kai Halsas	Indoor News, April 1994

All of them explain, in different ways, how to calculate the diameter of the can and the angle of the sloping line. To do this, they employ a combination of formulae, graphs, tables and even computers. In contrast, the method described here requires little or no calculation. As a preliminary, it is necessary to consider pitch distribution. All the writers, with the exception of Andresen, agree that, in can-formed props, the correct pitch occurs at only one or two locations along the length of the blade (Andresen gets around this by using scimitar

shaped blades). They disagree, however, on where those locations should be. Chernoff and Williams opt for hub and tip. Henderson, root and tip. Meuser, some distance in from the root and tip. Tenny and Halsas, at the 45° set-up angle.

I suggest a rather different approach. It is usually accepted that the most effective part of a prop blade is around 70% of the overall radius. Therefore, it seems logical for the correct pitch to apply at that position. Before starting on the practical process, the following must be decided.

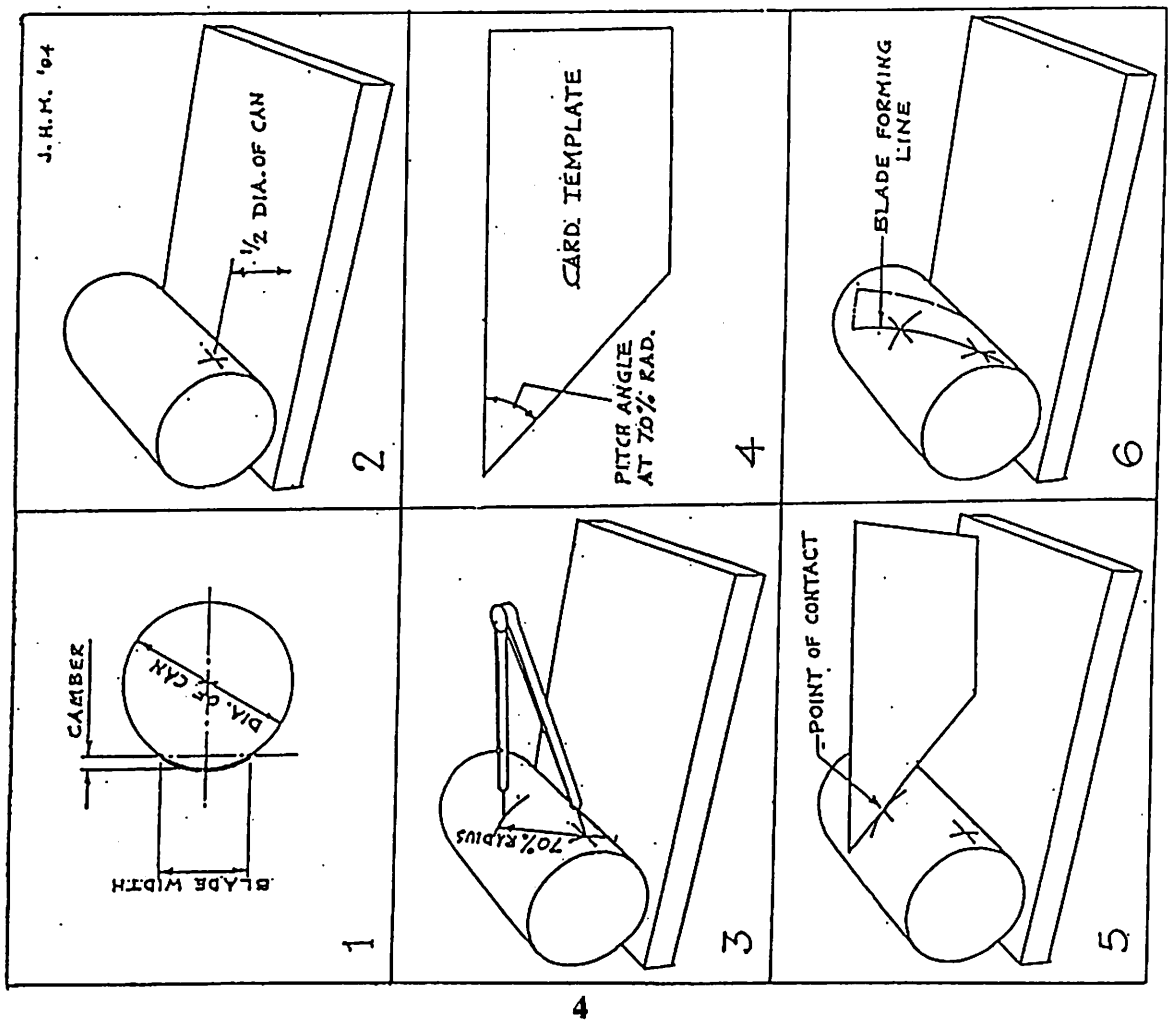
The prop overall radius and hence 70% radius.
The pitch and hence pitch angle at 70% radius.
The maximum blade width.
The camber, as a percentage of the blade width.

Pitch angle can be obtained from the equation Tan = Pitch/6.28 Radius, or from the tables at the back of Ron Williams' book (Note - in those tables "radians" should read "degrees").

Start by marking the maximum blade width on a line. Then, on another line, bisecting the first, mark the camber height. Now, with a compass, find, by trial and error, the radius which passes through these three points. This gives the diameter of the can (Fig. 1). Select a can of about the right size and fix it to a flat base of chipboard or similar. A few spots of cyano glue will hold the can, yet break away easily when required. Make a mark on the can at a height above the base board equal to half the can diameter (Fig. 2). With this as a centre, and compass or dividers set to the 70% radius dimension, draw an arc on the can (Fig. 3).

Now make a template in stiff card, of the pitch angle at 70% radius (Fig. 4). Cut the sides using a sharp knife and a straight-edge to ensure that they are perfectly straight (later, when the prop is being assembled in a jig the same template gives the blade set-up angle). Rest the template on the base, tangential to the arc and slide it towards the can until it touches. Mark the point of contact (Fig. 5). With a strip of thick paper as a ruler, draw a line through the two points on the can and extend it to include the tip (Fig. 6). Small patches of double-sided tape will prevent the paper slipping.This is the line on which the blade centre lies when being formed.

In a way, this method is more accurate than the others because it allows for the fact that sections through the can, in line with the blade chords, are ellipses. The calculated methods assume them to be circles.



It is necessary to say one thing straight away. Can formed props are very inaccurate, particularly at low P/D ratios, if you are trying to produce a 'true helical pitch' propeller. Therefore a lot of clever calculation or lengthy tables do not produce a better propeller - they produce a more accurate inaccurate one if you see what I mean! However I have looked at their layout in the past so I would like to comment on the references quoted in the October 94 Newsletter and Joe Maxwell's article and then try to contribute something myself.

Max Chernoff (Zaic 1964) did not seem to appreciate that the method is not accurate and indeed states that it assures true pitch values. As he does not consider any root cut off the results of his tables would not be good.

Bob Meuser (NFFS Sympo 1973). As is usual with Bob Meuser, a masterly treatise that says it all. A full discussion of the errors and the best way of handling them. I suppose the only trouble is that because it was comprehensive it looked a bit daunting and so probably wasn't read as much as it merited.

Ron Williams (his 1981 book). This excellent book unfortunately managed to make the can forming calculations look difficult. It made no mention of how the inevitable inaccuracies affect the calculations but at least, in a footnote, it did admit that there were inaccuracies.

I do not have the September 1989 'Model Aviation' but the bits by Bud Tenny and Bill Henderson in the other issues don't say anything new. Indeed Bud Tenny's spread sheet computer approach really confuses things. I don't doubt that it was done with the best of intentions and that the underlying formulae are correct but the strange choice of input values makes most of the output a nonsense. The most amusing thing to me in Bud's column was that someone has produced for sale a block in the shape of a tin can for producing can form props! How crazy can things get?

Regarding Joe Maxwell's own approach. It is a novel idea to slide the angle template up to the can. Extending this idea, I think that using templates with the correct angles for several stations along the blade would enable one to draw a curved blade similar to what I assume to be the Andreason approach. There are a couple of other points with which I would take issue. First, by ignoring the fact that most indoor propellers blades are cut off some distance from the root, the method gives a blade angle distribution which is less good than it could be. (This will be made clearer later on.) Second, I do not think that basing the can diameter on the aerofoil camber is a practical idea. In any case the approach in the sketch is not correct because the section of the can forming the camber is an ellipse. Joe mentions, in his last paragraph, that the cross-sections are ellipses but ignores it as it affects the camber.

INACCURACIES

Refer to Figure 1. This shews the angle variation of a helical pitch propeller for P/D ratios of 1, 1.5 and 2. There is also a dotted, straight line on the graph representing the angle variations of a can formed blade. The problem is to match the straight, can formed, angle variations to the curved, helical pitch, angle variations. The straight line can be moved up and down the graph by choosing a suitable setting angle when we mount the blades on to the hub. The slope of the straight line can be varied by varying the slant angle at which the blade blank is mounted on the tin can. What we cannot do is change the straight line into a curve (unless we use something like Andreason's scimitar blades).

You will notice that the angle variation for helical twist is greatest near the hub. However, if the blades do not start from the hub, as with most indoor propellers, then this area of high twist can be ignored. I recommend that the blades are started at 0.2 radius to give the can forming a reasonable chance and the following procedures are based on this figure. It is now only necessary to match the straight line to the curved region between 0.2 radius and the tip. This is somewhat better but the errors are still significant. Without wasting space on the proof (which is well covered in Bob Meuser's paper) it can be stated that at a P/D of 2 the total error in blade angle will be 6°, at P/D of 1.5, 8° and at P/D of 1, 10°.

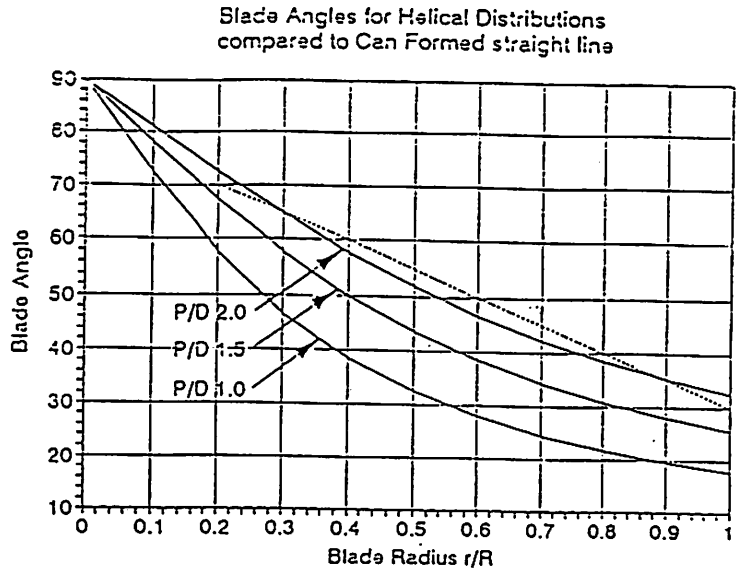


Fig. 1

THE REQUIRED TWIST

If the blade angles for helical twist are checked at the 0.2 radius and at the tip we get the following figures.

P/D	0.2 R. Angle	Tip Angle	0.2 R.-Tip
1.0	57.86	17.66	40.20
1.5	67.27	25.52	41.75
2.0	72.56	32.48	40.08

The last column gives the total twist along the blade and it will be noticed that it varies by only 1.75 degrees over this wide range of P/D. In what follows I use 40° as a constant. It is easy to use the precise figure if you want to (as shewn in the next paragraph) but is it worth it when the other inherent errors are so much greater?

WHAT WE NEED TO DO

All we have to do is to lay the blade on the can so that it is twisted by 40°. If we were calculating this, (which is the easiest way!), we would need to calculate $L=R\theta$ where R is the tin radius θ is 40° in radians (0.698) and L is the distance we wrap the blade around the can. However, as most people seem to prefer a graphical approach, I have drawn Figure 2 which gives the wrap around for different can diameters. If you want to draw your own diagram, θ is the amount of twist and the scale (although marked can diameter for convenience) is the can radius multiplied by $\theta/\tan\theta$ where θ again is in radians.

DOING IT

1. See Figure 3. Lay a strip of paper on Figure 2 at the chosen can diameter and make marks on the edge of the paper where it crosses the sloping lines.
2. See Figure 4. Wrap the strip of paper around the can and make marks on the can in line with the marks on the strip. Draw two vertical lines on the can in line with marks.
3. See Figure 5. Do whatever you do to the blade blanks as regards to soaking etcetera and fasten them to the can with the centre points at each end of the blade aligned with the vertical lines. You do NOT need to draw slanting lines. Note, as mentioned previously, this assumes that the hub end of the blade is at 0.2R.
4. Attach the blades to the hub at an angle that distributes the errors in the way that you prefer. To amplify that. A can formed blade has more angle at the centre than a helically formed one. For example at a P/D of 2 the error is 6° as mentioned earlier. If the centre of the can formed blade is set at the correct angle for a P/D of 2 (46.7°) then the root and tip will be washed out by 6°. It may seem sensible to set the centre at 49.7° to average out the error but do not forget that the root and tip are much less effective than the centre and you may finish up with too high an effective pitch.

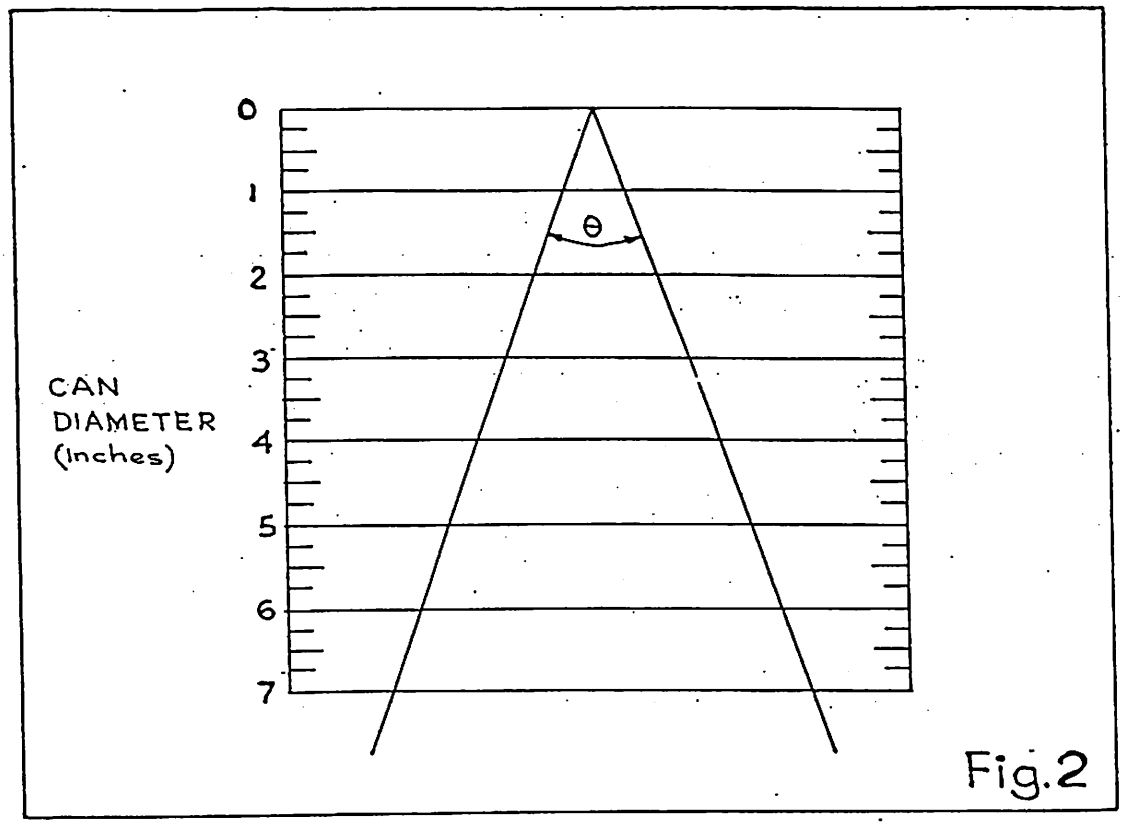
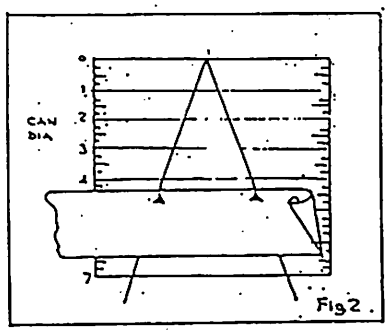
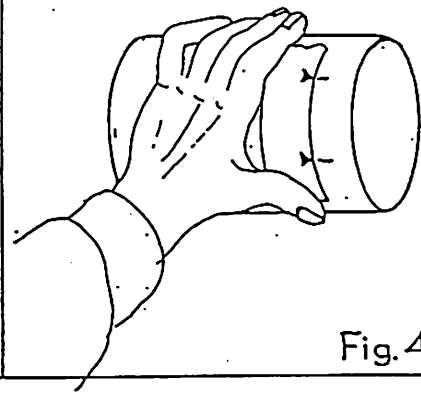
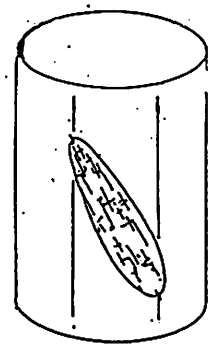


Fig.2


Fig.3


Fig.4


Fig. 5

CLOSING COMMENTS

I leave the choice of can size to you. It soon becomes obvious what size of can is going to produce a decent prop and clever calculations are not warranted. I also do not think that it is worth trying to pick the can to give blade camber.

The steps given here to set a blade on the can only take about fifty seconds to carry out - and that includes measuring the can diameter! However, do not get the impression that this method is some quick and dirty approximation. It is accurate as far as can formed propellers can be accurate and must be more accurate in use than any of the methods which try to draw a sloping line at a precise angle on the outside of a cylinder.

So much has been written about can formed props that they now have a mystique which I do not think is warranted. It is a useful way of turning out a propeller in a hurry. If, sometimes, the result is as good as a propeller produced by more conventional means, then it is a matter of pure chance and not because the method has any particular aerodynamic merit.

John Barker

AN UNIVERSAL FORMING BLOCK FOR PROPELLER BLADES

KAI K. HALSAS ANTTI T. JOLMA

INTRODUCTION

The construction of the propeller is quite often turning off the beginner from building Indoor Models. Calculating and carving a form block is at least time consuming. Cylindrical "form blocks" such as soft drink and beer cans etc. are easily available and can be used without any mathematics. An adequate result is obtainable only by putting the pre-soaked blade on a can in 15 - 20 ^{0} angle in relation to the cylinder center line. There are published a number of mathematical formulas and methods how to define the angle for laying the propeller blade blank on a cylinder. The authors have, however, developed a nomogram (1) as a practical tool for those modelers who would like to produce can formed blades "with less degree of inaccuracy" when compared to the true helical pitch distribution.

In the following we present a method how to use a cone as a form block. It is possible to show that the method gives a pitch distribution very close to true helical. The deviation is less than 1^0. Our earlier nomogram is also valid with some restrictions for cones as a form block but for convenience we will show the nomogram again with small modifications.

BLADES FORMED ON A CONICAL SURFACE

Conical surfaces have also been used for forming Indoor Model propeller blades or cutting blades from conical plastic containers. Cutting angles are presented on a basis of "a rule of thumb" which of course gives an adequate result on a little higher level of accuracy as compared to cylinder formed blades. Our aim is again to create a practical method without extensive calculations. (Mathematical background is available on request).

The following design criteria will be needed:

P/D	P = pitch and D = prop. diameter
rr/r	rr = blade root radius and r = prop. radius = D/2
L	L = blade length

The design data in our exercise are: P/D = 2.2, rr/r = 0.14 and L = 76 mm (LRS Mini Stick propeller). A cone of 30^0 tip angle should be available. (Other shapes are also possible.)

HOW TO LOCATE THE BLADE ON THE CONE

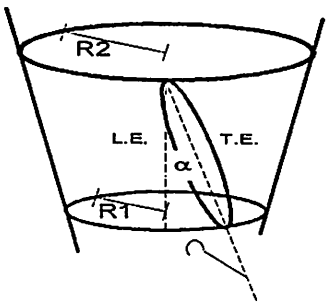
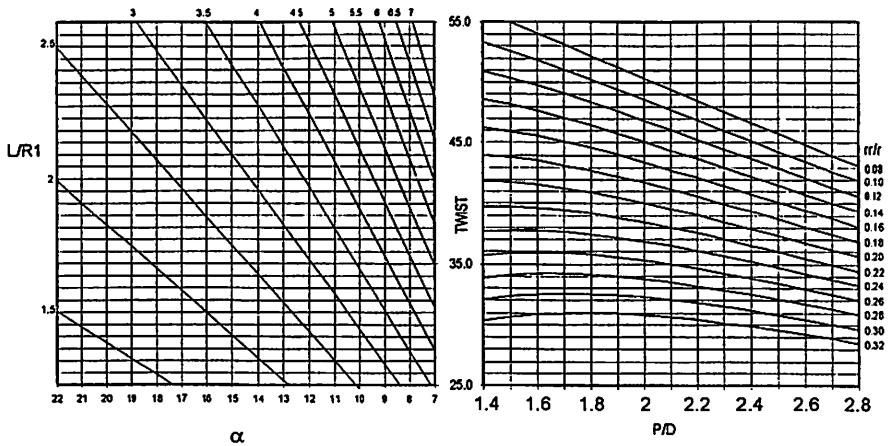


Table 1 gives the L/R1 as a function of P/D and rr/r. R1 is the radius of the cone at the blade root. R2 is accordingly the cone radius at the blade tip. Our main concept is to define the blade twist to be equal to that of helical twist in three points - in the both ends and in the middle of the blade. The practical procedure will be as follows:

1. Read the L/R1 = 2.91 (Table 1)
2. Calculate R1 = 76/2.91 = 26.1 mm
3. Locate R1 on the cone surface. A scale can be drawn on the cone surface for different R values. The location can be checked also with a caliper (Remember to use 2 x 25.3 as the diameter)
   Read the angle α using the enclosed nomogram. The angle is about 15 ^{0}
4. Mark the angle on the cone surface. Note: The angle must be "open" towards the R1 and located as shown in the picture.
5. Put the blade on the cone at angle α.

TABLE 1. L/R1 as a function of P/D and rr/r.

				P/D				
rr/r	**1.40**	**1.60**	**1.80**	**2.00**	**2.20**	**2.40**	**2.60**	**2.80**
0.08	6.15	5.04	4.20	3.55	3.03	2.62	2.28	2.01
0.10	6.01	4.94	4.13	3.50	3.00	2.59	2.26	1.99
0.12	5.85	4.84	4.05	3.44	2.96	2.56	2.24	1.97
0.14	5.69	4.72	3.97	3.38	2.91	2.53	2.21	1.95
0.16	5.52	4.60	3.89	3.32	2.86	2.49	2.18	1.93
0.18	5.34	4.48	3.79	3.25	2.81	2.45	2.15	1.90
0.20	5.16	4.35	3.70	3.18	2.75	2.40	2.11	1.87
0.22	4.97	4.21	3.60	3.10	2.69	2.36	2.08	1.84
0.24	4.79	4.07	3.49	3.02	2.63	2.31	2.04	1.81
0.26	4.60	3.94	3.39	2.94	2.57	2.25	1.99	1.77
0.28	4.41	3.79	3.28	2.85	2.50	2.20	1.95	1.73
0.30	4.23	3.65	3.17	2.77	2.43	2.14	1.90	1.70



CALCULATIONS FOR TYPICAL INDOOR MODELS

The enclosed table 2 is calculated for a 30 ^{0} cone

TABLE 2

Model	P/D	rr/r	L mm	L/R1	R1 mm	α ^{0}
EZB	2	0.19	133	3.21	41	13
P-P	2	0.08	143	3.55	40	14
FID-B	1.6	0.14	167	4.72	35	10
LRS	2.2	0.14	76	2.91	26	15
LRS	2.8	0.13	75	1.96	38	21

The nomogram and the table can be used for Indoor Models which have a P/D ratio between 1.4 - 2.8.
Models like Pistachio and Peanut which have a low P/D ratio (0.8 - 1.4) need a separate nomogram and table which can also be provided by request.)

ACCURACY

As mentioned earlier, we do not want to do things too complicated. We would like to point out, that any shape of cone can be used. The tip angle must not be exactly 30 ^{0} The result will always be less inaccurate than with cylinder formed blades. For information we have compared 1) a cylinder (R = 25 mm) formed blade, 2) a blade formed on a coffee cup with a tip angle of 15 ^{0} and R1 = 25 mm and 3) a blade formed on a 30 ^{0} cone using the LRS propeller in our earlier example. As a reference we have used the true helical pitch distribution.

TABLE 3. Comparison of blade angle differences with true helical pitch.

Errors in ^{0}	Station from blade root to the tip along blade as %										
	0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Cylinder	0.0	2.1	3.8	5.0	5.7	5.8	5.4	4.6	3.4	1.9	0.0
Coffee cup	0.0	0.9	1.7	2.3	2.7	2.8	2.6	2.2	1.7	0.9	0.0
Cone 30°	0.0	-0.6	-0.6	-0.5	-0.2	0.0	0.2	0.2	0.2	0.2	0.0

We note that even for the "coffee cup" cone the difference from true helical pitch is only 50% of the cylinder formed blade error, and for case 3 the difference is clearly under 1 ^{0} As a conclusion it can be determined that any cone (variable tip angle) gives less inaccuracy than a cylinder formed blade.

SET-UP ANGLE.

The propeller blade is usually glued to the spar on a pitch gauge at a certain angle (Set-up angle).
For a cone formed blade, where the difference from true helical pitch is neglible, the Set-up angle can be placed where most convenient. For a P/D = 2.2 propeller the Set-up angle could be preferably 45 ^{0} and located at 0.7 r.
On the enclosed table 4 is shown the location of a 45 ^{0} Set-up angle or alternatively the numerical value of the Set-up angle at location 0.7 r, for different propeller P/D:s

TABLE 4

P/D	**1.4**	**1.6**	**1.8**	**2**	**2.2**	**2.4**	**2.6**	**2.8**
Set-up angle	45	45	45	45	45	45	45	45
Location factor	0.45	0.51	0.57	0.64	0.70	0.76	0.83	0.89

P/D	**1.4**	**1.6**	**1.8**	**2**	**2.2**	**2.4**	**2.6**	**2.8**
Location factor	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Set-up angle	32.5	36.0	39.3	42.3	45.0	47.5	49.8	51.9

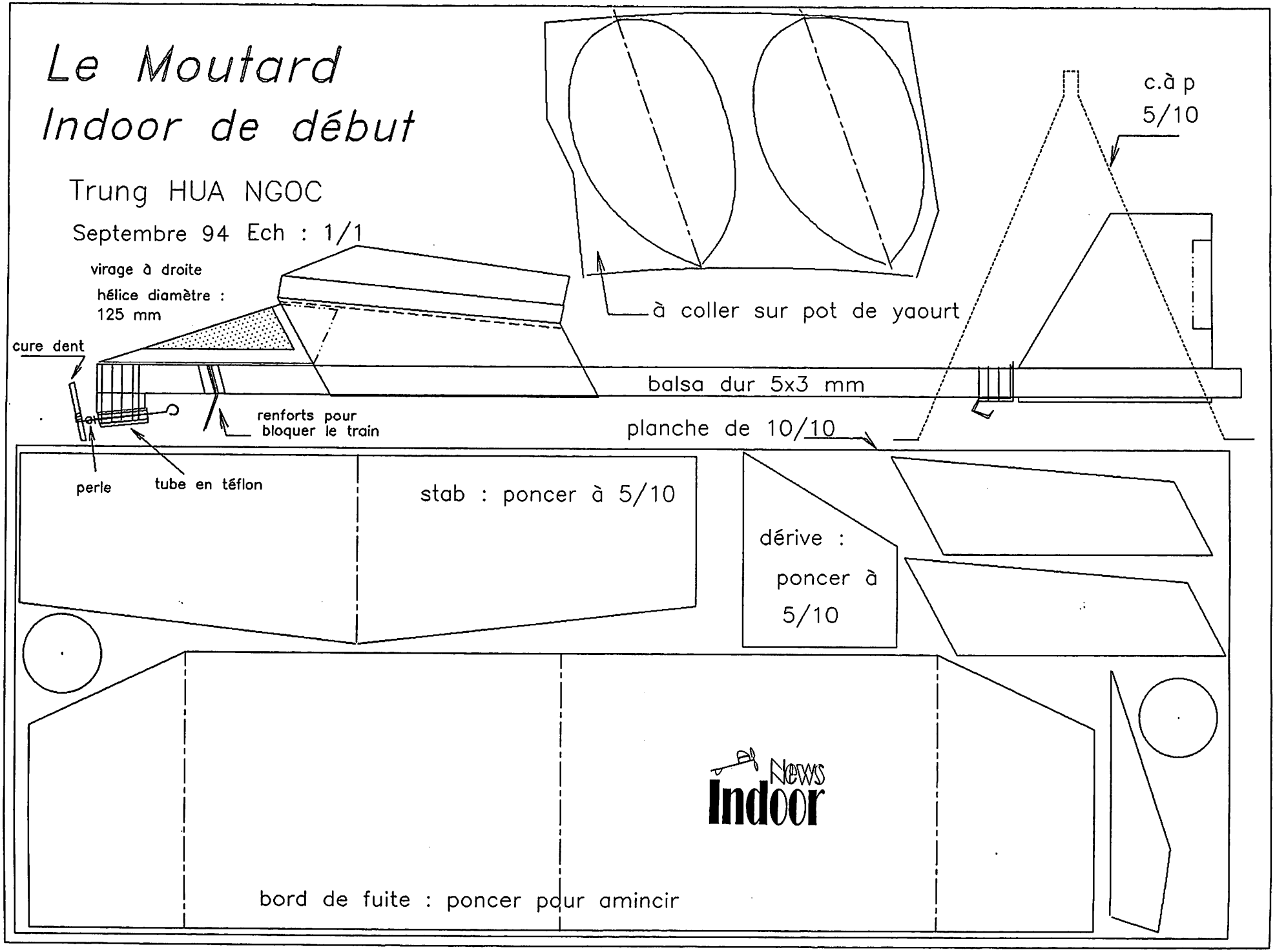
REFERENCES

(1) K.K. Halsas, A.T. Jolma: "Nomogram for can formed propeller blades" INDOOR NEWS, 1994:28

Le Moutard
Indoor de début

Trung HUA NGOC

Septembre 94 Ech : 1/1



le FARMAN SPORT 1926
la CARTE POSTALE

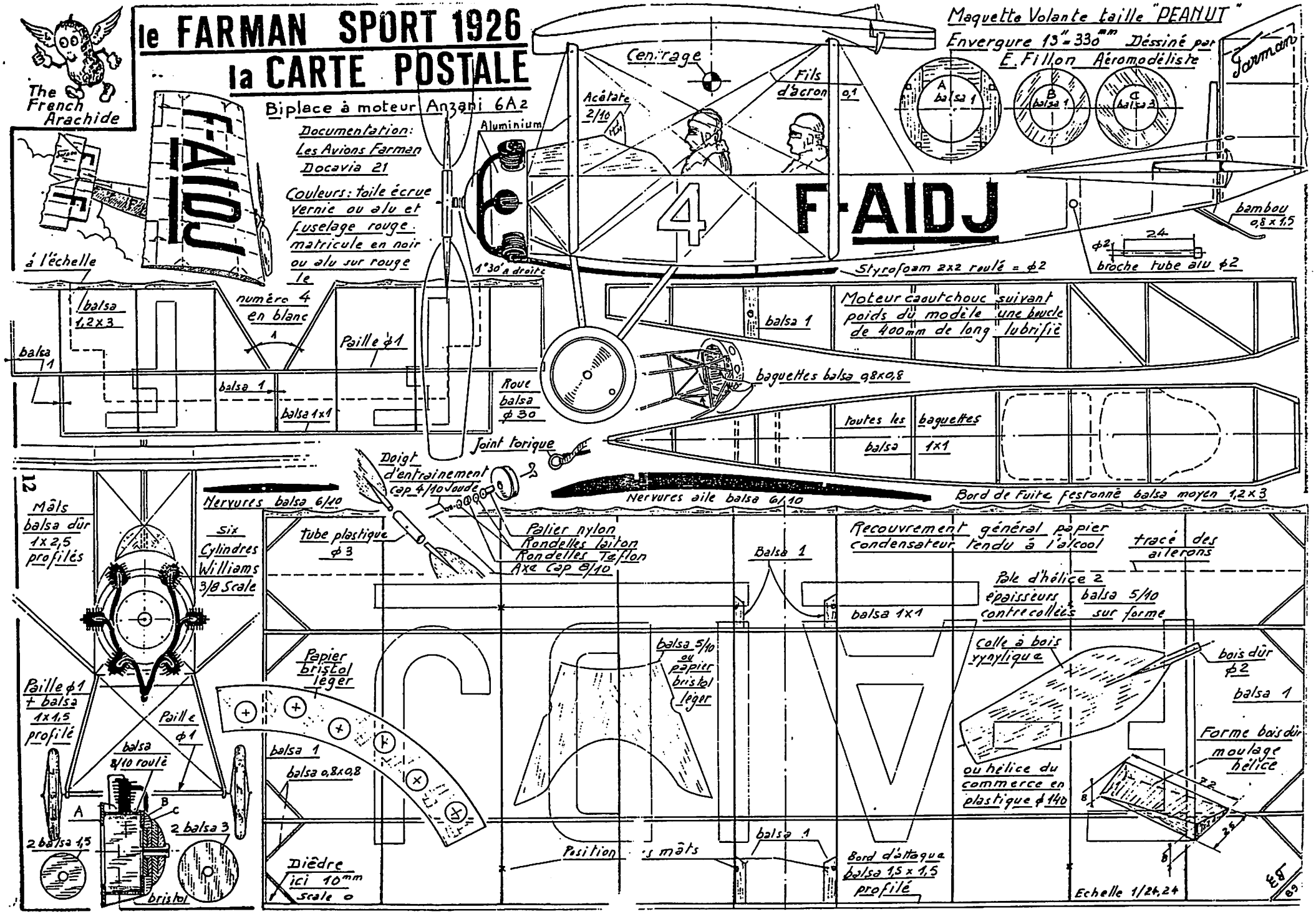
The French Arachide

Biplace à moteur Anzani 6A2

Documentation:
Les Avions Farman
Docavia 21

Couleurs: toile écrue vernie ou alu et fuselage rouge: matricule en noir ou alu sur rouge le numéro 4 en blanc

Maquette Volante taille "PEANUT"
Envergure 13" = 330 mm Déssiné par E. Fillon Aéromodéliste



Le Moutard
by Trung HUA NGOC (FRA)

This little ROG model is one of the projects for my school club. Moutard means "kid" in french. Members of the club are relatively young (from 10 to 12), so I have to help them to build the prop and the undercarriage. The blades are cut from yoghurt pot thinned by sanding and fixed to the prop spar with CA glue. CA glue doesn't work well with plastic. To have a better grip a piece of "magic Scotch" tape is put on to get a sufficiently rough surface for glueing. This method can also be used to attach the teflon tube to the motor stick. Teflon tube is a hard to find item. I now use TV antenna cable.

The undercarriage is optional and many of my pupils prefer to hand launch their planes because that is easier than to let them ROG. The position of the CG is not critical and the model is a good flyer. Do not forget to lighten the rear side by sanding the leading edges and the tail and rudder to 0.5 mm thick.

SUPPLIERS

John Tipper F1D Indoor Supplies - Rubber Strip, O-rings, Lube, Balsa Wood, Covering materials, Glue, Balloons, Accessories, Beginners kits. For full list and prices send S.A.E. to: F1D Indoor Supplies, John Tipper, 23 Green Lane, Chichester, West Sussex PO8 9RA, England.

Joe Maxwell's "Aids for Advanced Aeromodellers" - Microfilm Propeller Jigs, Propeller Form Blocks with Camber machined-in, Rib Form Blocks and **Stiffness Graded Balsa**. For Indoor Catalogue send S.A.E. (overseas readers please send 2 International Reply Coupons or $1 bill) to: Joe Maxwell, 14 Upper Craigs, Stirling FK8 2DG, Scotland.

CORRECTIONS TO THE DICTIONARY

Jean-Francis Frugoli kindly sent the following corrections to the french part of the dictionary:
Dictionnaire - with 2 n
Intérieuré - without -e
Nervure centre should be: nervure centrale
Nervure exterieure: nervure marginale
Blade: Lame (without pale)
Pâle: pale
Courbure should be cambrure

INDOOR ON INTERNET?

Sven Pontan asked whether I have access to E-mail. I have not, but maybe some of the readers have. So far he has only found a few RC-related and IPMS home pages via Netscape in the World Wide Web. Indoor News could be of help in finding such information and can also publish your fax and E-mail addresses if you wish. Send your information to the editor at the address in the colophon.

Roy White (INAV)
1025 Cedar Street
Catawissa, MO 63015
314-271-2243

FAX# 314-296-4554 (Larry Coslick)

1995 UNITED STATES INDOOR CHAMPIONSHIP PROGRAM

Every flyer who enters the contest will receive a Program. The contents will include:

- General information about the Johnson City site.
- Site records (so that you will know what times you have to beat!)
- Nostalgia plans
- Most of the winning designs from the 1994 USIC

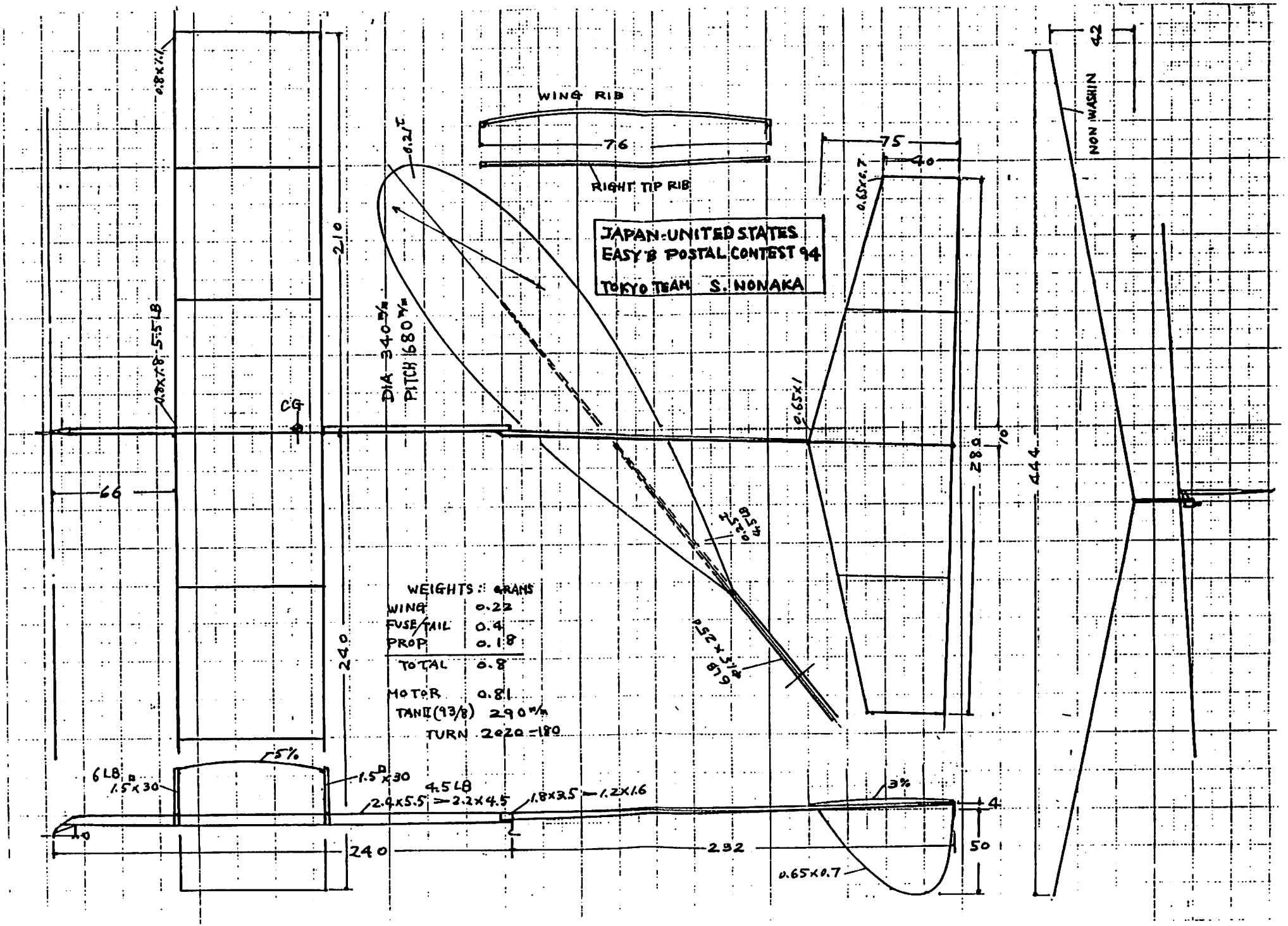
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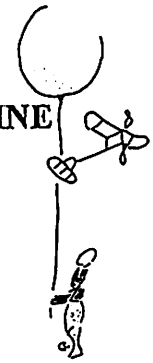


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76
RIGHT TIP RIB
JAPAN-UNITED STATES
EASY B POSTAL CONTEST 94
TOKYO TEAM S. NONAKA
0.8x1.1
0.8x1.8 5.5LB
CG
66
210
240
DIA 340mm
PITCH 680mm
0.2"
0.65x1
0.65x0.7
75
40
NON WASHIN
42
289
10
444
WEIGHTS : GRAMS
WING 0.22
FUSE/TAIL 0.4
PROP 0.18
TOTAL 0.8
MOTOR 0.81
TANII(93/8) 290m/m
TURN 2020-180
6LB
1.5x30
1.5Dx30
5%
4.5LB
2.4x5.5 = 2.2x4.5
1.8x3.5 — 1.2x1.6
3%
4
50
240
232
0.65x0.7

CRITERIUM INTERNATIONAL SEVRES & MAINE

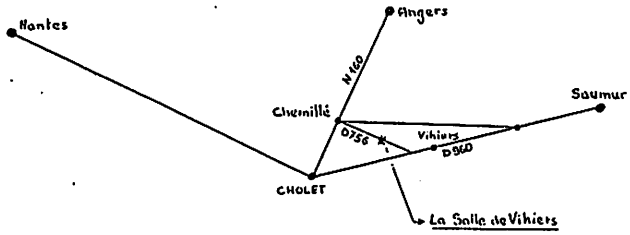


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Merci d'en faire toute publicité, y compris dans Indoor News.
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Canard	Canard	Entenmodell
Carve	Tailler	Schneiden
Cement	Colle	Leim
Center of gravity (CG)	Centrage	Schwerpunktlage
Center of pressure	Centre de poussée	Auftriebsmittelpunkt
Center panel	Panneau central	Innenteil (Flügel)
Center rib	Nervure central	Mittelrippe
Chord	Corde	Flügeltiefe
Circling	Virage	Kreisen
Climb	Grimpée, montée	Steigflug
Compression rib	Nervure de compression	Kompressionsrippe
Condenser paper	Papier condensateur	Kondensatorpapier
Contest	Concours	Wettbewerb
Control surface	Empennage	Leitwerk
Convex profile	Biconvexe	Konvexprofil
Covering	Recouvrement, Entoilage	Bespannung
Cowling	Carénage	Motorhaube
Cross section	Maître-couple	Querschnitt

D

Diameter	Diamètre	Durchmesser
Dihedral	Dièdre	V-Form
Dive	Piqué	Sturzflug
Dope	Enduit de Tension	Spannlack
Dowel	Goupille	Rundholzstab
Downthrust	Piquer au Moteur	Sturz (motor)
Drag	Trainée	Widerstand
Duration	Durée	Dauer

E

Elevator	Profondeur	Höhenruder
Engine	Moteur	Motor
Exhaust	Echappement	Auspuff

F

Fiberglass	Fibre de verre (F.D.V.)	Glasfaser (GFK)
Fin	Dérive	Seitenleitwerk
Fixing	Fixation	Befestigung
Flat section	Profil plat	Flachprofil
Flight velocity	Vitesse de vol	Fluggeschwindigkeit
Former	Couple	Spant
Frame	Chassis	Rahmen
Free Flight	Vol Libre	Freiflug
Front spar	Longeron avant	Vordere Holm
Fuselage	Fuselage	Rumpf

G

Glide	Plané	Gleitflug
Glider	Planeur	Segelflugmodell
Gloss	Lisse	Glatt
Glue	Colle	Leim
Grain	Fil du Bois	Holzfaser
Grain filler	Bouche-pores	Porenfüller
Gusset	Gousset, Renfort	Verstärkung

H

Handlaunchglider(HLG)	Planeur Lancée Main	Wurfgleiter
Hardwood	Bois dur	Hartholz
Heavy	Lourde	Schwer
Hinge	Charnière	Scharnier
Hook	Crochet	Haken

I

Incidence	Calage	Einstellwinkel
Incidence difference	Decalage	Einstellwinkeldifferenz
Indoor flying	Vol d'Intérieur	Saalflug

J

Japanese Tissue	Papier Japon	Japanpapier
Jig	Fixture, gabarit	Helling
Joint	Joint	Verbindung

K

Knot	Noeud	Knote

L

Laminate	Contrecollage	Laminiert
Landing	Atterir	Landen
Landing gear	Train d'atterissage	Fahrwerk
Launch	Largeur, largage	Start(-freigabe)
Lead	Plomb	Blei
Leading edge	Borde d'attaque (B.A.)	Eintrittskante
Lift	Portance	Auftrieb
Longeron	Longeron	Holm
Loop	Boucle	Schlinge
Low wing	Aile basse	Tiefdecker